TECHNICAL SUPPORT DOCUMENT FOR AGENCY POLICY CONCERNING DESIGNATION OF ATTAINMENT, UNCLASSIFIABLE, AND NONATTAINMENT AREAS FOR OZONE

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1.0 INTRODUCTION

On March 3, 1978, the Administrator of the Environmental Protection Agency (EPA) promulgated air quality designations for all areas of the country specifying whether the National Ambient Air Quality Standards (NAAQS) required to have been attained under the 1970 Clean Air Act have been, in fact, attained. The Administrator's designations were required by the 1977 Amendments to the Clean Air Act, Pub. L. No. 95-95, 91 Stat. 685 (August 7, 1977). Under Section 107(d) (1)-(2) of the Amendments, each State was required to assess the air quality within its borders and submit a list to the EPA identifying those areas in the State which attained the National Ambient Air Quality Standards, those which had not and those areas which could not be classified. The Administrator was to review the State's designations and promulgate his own list with any modifications he deemed necessary. On March 3, 1978, the Administrator promulgated the designations. 43 Fed. Reg. 8962.

Even though the designations were immediately effective, the EPA solicited public comments on the designations. On September 11, 12, and October 5, 1978, the Agency published responses to many of the comments received; in many cases designations were changed. See 43 Fed. Reg. 40412, 43 Fed. Reg. 40502, and 43 Fed. Reg. 45993. The State of New Jersey submitted comments challenging the Agency's policy for designating areas as attainment, nonattainment, or unclassifiable for the ozone standard. This technical support document responds to each of the technical comments submitted by New Jersey and supports the Agency's March 3, 1978 policy for ozone designations.

In the March 3, 1978 promulgation, the Administrator determined that, in the absence of ambient data to the contrary, all urban areas of the country

(with a population greater than 200,000) and all rural counties with air quality readings higher than the ozone pollution standard, must be designated nonattainment areas. The Administrator also determined that without actual air quality measurements taken from ground level monitors, the available information is not sufficient to require a nonattainment designation in rural areas in the Eastern portion of the country and that such areas may be designated as "unclassifiable" under Section 107(d) (1) (D).

In guidance to the States, the Assistant Administrator for Air, Noise and Radiation stated that there is scientific evidence that, for many of the areas in the Eastern portion of the country without ozone monitoring data, ozone pollution is probably greater than allowed by the national standard. See 40 C.F.R. 50. The Assistant Administrator, therefore, encouraged the Eastern States to list those areas as nonattainment areas for ozone pollution even though there is no actual monitoring data showing nonattainment. The State of New Jersey followed the EPA suggestion and the entire State was designated as nonattainment for ozone pollution. See 43 Fed. Reg. 9015. In contrast, many other States did not follow the EPA's suggestion and designated areas in their States without ozone monitoring data as unclassifiable. Since the Agency determined that, without actual monitoring data, it is impossible to determine for certain that a rural area is nonattainment, the Agency approved the unclassifiable designations.

In comments submitted on the March 3, 1978 promulgation,[1,2] the State of New Jersey contends that the EPA's suggestion to the States to designate rural areas without monitoring data as nonattainment should have been a requirement and that there is sufficient information to find that in all areas east of the

ississippi River ozone pollution is greater than the national standard allows. ew Jersey, therefore, argues that all areas in the Eastern half of the country ust be designated nonattainment under Section 107(d) (1) (E) of the Act. As et forth in detail in the section below, the Agency has determined that the cientific information relied upon by New Jersey is not definitive enough to equire that all areas in the Eastern portion of the country must be designated ionattainment. Moreover, the Agency's implementation of the nonattainment and revention of significant deterioration (PSD) provisions of the 1977 Amendments hould insure that the national standard for ozone pollution is attained and naintained.

In summary, New Jersey's position is rejected as both unnecessary and unsupportable for the following reasons. First, chemical stability of ozone and its precursors does not allow significant concentrations of ozone to be transported 1000 miles as suggested by New Jersey. Ambient concentration of ozone can not persist more than approximately 36 hours unless fresh precursor emissions occur. Thus, under meteorological conditions prevailing on days with high ozone, this limits significant transport to less than 300-500 miles. Since 91 percent of the major stationary sources within 500 miles of Trenton, New Jersey that cause ozone pollution are situated in areas designated non-attainment, the designation of additional areas in the Eastern portion of the country would have little effect on New Jersey's ozone problem. The areas that affect the State are, for the most part, already designated nonattainment. Assuming that longer range transport were significant, approximately 79 percent of major stationary sources within the Eastern U.S. are located in nonattainment areas. Moreover, the data relied upon by New Jersey, specifically aircraft

flight data, to argue that all areas in the Eastern portion of the country are nonattainment does not establish New Jersey's position. There is simply too poor of a correlation between the aircraft measurements and corresponding ground level measurements to use aircraft data as a proxy for ground level monitors.

Second, New Jersey is not prejudiced by the EPA's decision to approve State designations of rural areas without ozone monitoring data as unclassifiable. The Administrator's basic guidance to the States on the criteria the EPA will apply in determining if nonattainment SIP revisions are approvable states that, in setting emission reduction levels for sources in nonattainment areas, the States can assume that the air coming across the State borders meets the standards. Therefore, a State is required to regulate sources in the State only to the extent that these sources contribute to pollution. In other words, a downwind State does not have to overregulate to compensate for pollution caused by sources in the upwind State. See 43 Fed. Reg. 21673, 21674. It is also not possible for a new source to locate in an unclassifiable area and avoid the Act's requirements for nonattainment areas if air quality in that area is actually nonattainment. The PSD regulations specify that before a source may receive a permit to construct, the Agency can require ambient air monitoring for up to one year in the unclassified areas in which the proposed facility is to be constructed. If the monitoring shows that ozone levels are above the standards, the area will then be redesignated as a nonattainment area under Section 107(d) (5) and the new source would have to comply with the Act's requirements for new sources in nonattainment areas. See 40 C.F.R. 52.21, 43 Fed. Reg. 26403, 26410. In short, the EPA's ozone

nonattainment designations do not harm existing sources in New Jersey by requiring that New Jersey overregulate as New Jersey alleges, nor prejudice New Jersey by permitting the location of new sources in unclassifiable areas.

Finally, the Agency is taking action to determine if the rural areas designated unclassifiable are actually attainment or nonattainment. The Assistant Administrator has directed the EPA's Regional Offices to review the areas designated unclassifiable and determine where there is a high probability that the ozone standard may be violated. The States may then be required either to conduct monitoring in the areas or require "reasonably available control technology" (RACT) on existing sources in the areas. The Agency is also conducting scientific studies to identify more accurately the area represented by ozone monitor readings. At present, it is scientifically unclear just how large a geographic area a monitor reading represents. Until the EPA studies are completed, it is the EPA policy that ozone monitors will determine air quality for the entire county where they are located.

Accordingly, the EPA has determined that New Jersey has not submitted information which requires a change in the EPA designation policy in ozone and previous designations are affirmed.

2.0 PRESENT DESIGNATIONS RESULT IN COMPREHENSIVE COVERAGE OF KNOWN VOLATILE ORGANIC COMPOUND ESTIMATES

As is explained in Section 5.0 below, ozone pollution is controlled by reducing emissions of volatile organic compounds (VOC) from stationary sources and motor vehicle emissions. Evidence compiled from the U.S. EPA's National Emission Data System (NEDS) establishes that there is only a small fraction of volatile organic compound (VOC) emissions within 500 miles or more of Trenton that are not situated in areas designated nonattainment. The small percentage of VOC emissions within 500 miles of Trenton and located in unclassifiable areas are unlikely to significantly contribute to New Jersey's ozone problem.

Table 1 sets forth the fraction of total volatile organic emissions within designated nonattainment areas in each State in the continental United States and within each EPA Region. The table reflects attainment/non-attainment designations as of August 1978 and emission data from the EPA's National Emission Data System (NEDS) as of June 1978. If States in EPA Regions I-V (i.e., see Table 1) are loosely interpreted as the "Eastern part of the Country," it can be seen that 71 percent of the organic emissions in the Eastern part of the United States are within designated nonattainment areas. This inventory includes an aggregate of stationary and motor vehicle emissions. Since mobile source emissions constitute a significant fraction of "nonpoint source" emissions and are subject to controls regardless of an area's attainment status, it is most pertinent to evaluate the fraction of stationary point source emissions included within designated nonattainment areas.

TABLE 1. Volatile Organic Compounds (VOC) Emissions in Counties Designated Nonattainment for Ozone: By EPA Region and State

EPA Region/State	VOC Emissions Unclassified Counties (TPY)	VOC Emissions Nonattaining Counties (TPY)	% VOC Emissions in Nonattaining Counties
Region I	13,726	1,393,895	99
Connecticut	-	309,563	100
Maine	9,251	137,537	94
Massachusetts	-	682,275	100
New Hampshire	4,475	102,120	96
Rhode Island	-	112,630	100
Region II	0	2,591,904	100
New Jersey	-	985,131	100
New York	-	1,606,773	100
Region III	668,915	2,045,785	75
Delaware	27,738	64,052	70
District of Columbia	-	79,090	100
Maryland	64,545	467,305	88
Pennsylvania	-	1,228,220	100
Virginia	407,289	207,118	34
West Virginia	169,343	-	0
Region IV	2,935,727	1,651,580	36
Alabama	346,152	182,047	34
Florida	382,858	558,171	59
Georgia	375,122	189,699	34
Kentucky	297,755	220,336	43
Mississippi	302,411	-	0
North Carolina	681,273	72,132	10
South Carolina	282,080	99,215	9
Tennessee	268,076	329,980	55
Region V	1,414,799	4,873,430	78
Illinois	225,034	1,205,346	84
Indiana	460,047	318,160	41
Michigan	108,859	1,219,350	92
Minnesota	231,130	337,748	59
Ohio	106,346	1,370,662	93
Wisconsin	283,383	453,278	62
Region VI	1,885,666	2,425,818	56
Arkansas	217,348	38,952	15
Louisiana	273,898	584,172	68
New Mexico	122,958	33,253	21
Oklahoma	273,917	168,903	38
Texas	997,545	1,600,538	62
Region VII	977,255	690,081	41
Iowa	305,401	95,153	24
Kansas	232,721	193,811	45
Missouri	282,779	337,250	54
Nebraska	156,354	63,867	29
Region VIII	458,089	324,683	41
Colorado	79,938	212,852	73
Montana	109,796	17,827	14
North Dakota	66,849	6,229	9
South Dakota	88,499	-	0
Utah	41,570	87,775	68
Wyoming	71,437	-	0
Region IX	256,269	2,659,926	91
Arizona	82,781	168,902	67
California	148,364	2,444,671	94
Nevada	25,124	46,353	65
Region X	563,739	370,271	40
Idaho	168,276	-	0
Oregon	141,205	189,919	57
Washington	254,258	180,352	41
Regions I-V Totals	5,033,167	12,556,594	71
National Totals:	9,174,185	19,027,373	67

Source: National Emissions Data System (NEDS)- June, 1978

In the NEDS data base, a point source is a stationary source which emits 100 tons per year (TPY) or more of any pollutant.[3] For example, if a source emitted 1 TPY of organics and 100 TPY of sulfur dioxide, it would be classified as a "point source of organic emissions." Therefore, the term "point sources" includes a number of stationary sources emitting less than 100 TPY of organic emissions. Table 2 depicts point source emissions included within areas designated nonattainment and unclassified for each State and EPA Region. Seventy-nine (79) percent of the point source emissions of organic compounds in the Eastern United States are situated in areas designated nonattainment. Figure 1 shows that, nationwide, nearly all counties either already have been designated nonattainment or are not believed to have significant VOC emissions.*

Most relevant to New Jersey's concerns is the fraction of point source emissions within about 36 hours travel time of New Jersey under meteorological conditions conducive to high ozone concentrations. As discussed in Section 5.0 below, a parcel of air is not likely to travel more than about 300-500 miles in a 36 hour period under such atmospheric conditions. Table 3 categorizes VOC point source emissions within 300-500 miles of Trenton, New Jersey according to whether or not the emissions occur within a designated nonattainment area. According to the NEDS inventory, over 95 percent of the point source emissions in the United States within 300 miles of Trenton (Table 3) are within areas designated nonattainment. Within 500 miles, greater than

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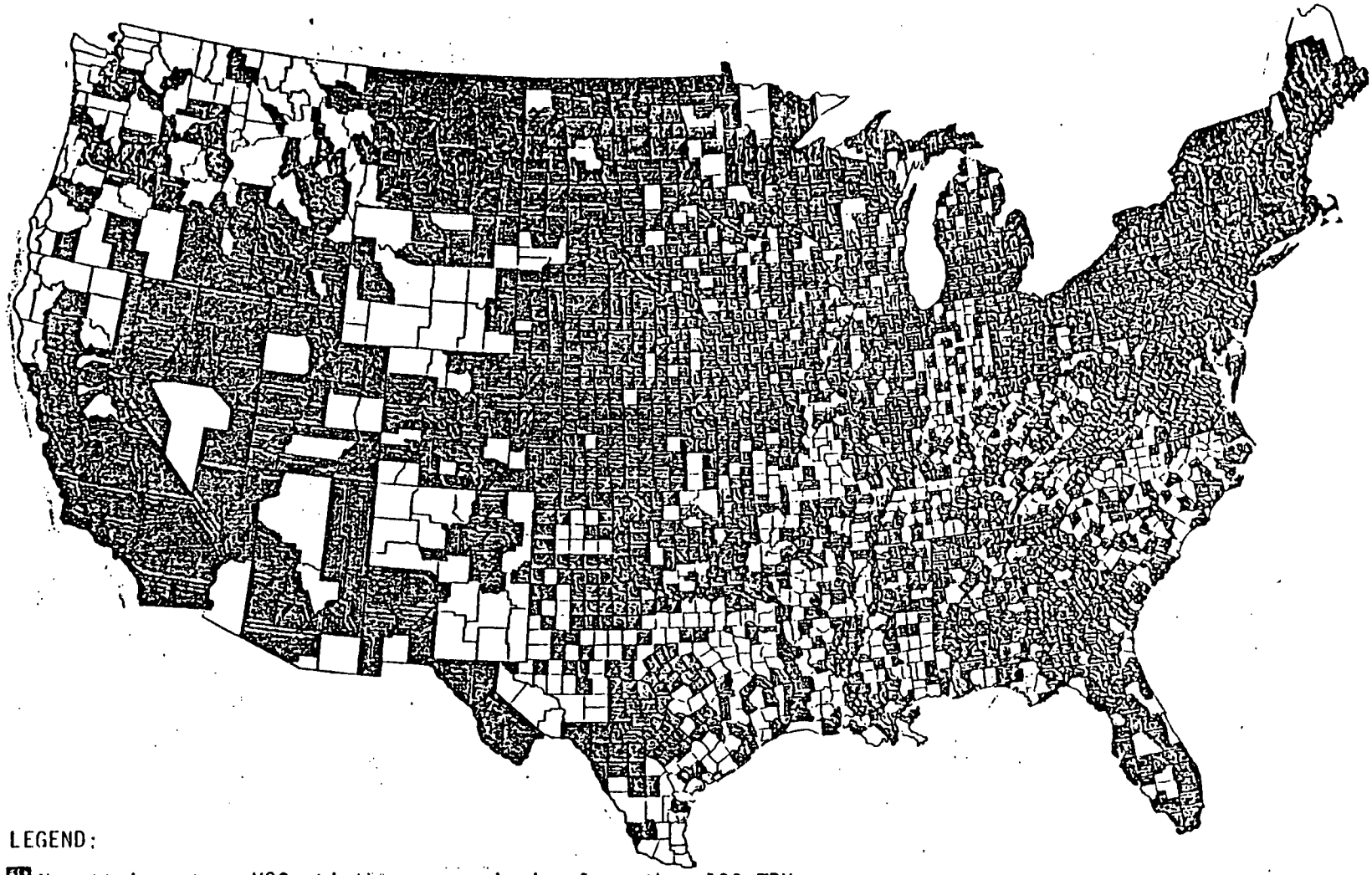
* Since Figure 1 was prepared, the State of Virginia reclassified a number of counties from "nonattainment" to "unclassifiable." While Figure 1 has not been modified, the information in Tables 1-4 has been adjusted to consider the reclassifications.

TABLE 2. Volatile Organic Compounds (VOC) Point Source Emissions in Counties Designated Nonattainment for Ozone: By EPA Region and State

EPA Region/State	VOC Point Source Emissions Total (TPY)	VOC Point Source Emissions Nonattaining Counties (TPY)	% Point Source Emissions in Nonattaining Counties
Region I	195,394	193,081	99
Connecticut	15,944	15,944	100
Maine	49,339	47,761	97
Massachusetts	84,177	84,177	100
New Hampshire	23,813	23,078	97
Rhode Island	17,136	17,136	100
Vermont	4,985	4,985	100
Region II	401,704	401,704	100
New Jersey	275,334	275,334	100
New York	126,370	126,370	100
Region III	391,528	278,985	71
Delaware	13,987	13,279	95
District of Columbia	775	775	100
Maryland	131,591	130,863	99
Pennsylvania	103,506	103,506	100
Virginia	130,849	30,919	24
West Virginia	10,820	0	0
Region IV	550,878	245,041	44
Alabama	43,186	37,816	88
Florida	28,363	15,274	54
Georgia	7,451	806	11
Kentucky	201,741	94,964	47
Mississippi	37,792	0	0
North Carolina	80,989	5,292	7
South Carolina	38,760	16,955	44
Tennessee	112,596	73,934	66
Region V	1,108,649	966,736	87
Illinois	235,009	228,790	97
Indiana	154,046	64,523	42
Michigan	220,141	215,910	98
Minnesota	118,608	88,110	74
Ohio	184,638	179,394	97
Wisconsin	196,207	190,009	97
Region VI	1,878,826	1,286,340	68
Arkansas	14,070	1,643	12
Louisiana	467,012	386,958	83
New Mexico	40,022	246	1
Oklahoma	73,075	10,619	15
Texas	1,284,647	886,874	69
Region VII	358,471	156,603	44
Iowa	62,316	1,523	2
Kansas	143,585	96,710	67
Missouri	107,851	43,877	41
Nebraska	44,719	14,493	32
Region VIII	65,576	22,443	34
Colorado	12,503	5,631	45
Montana	18,769	8,864	47
North Dakota	1,984	343	17
South Dakota	5,741	0	0
Utah	8,505	7,605	89
Wyoming	19,074	0	0
Region IX	322,002	300,315	93
Arizona	11,431	7,060	62
California	305,371	289,380	95
Nevada	5,200	3,875	75
Region X	76,762	32,205	42
Idaho	5,241	0	0
Oregon	28,688	18,015	63
Washington	42,833	14,190	33
Regions I-V Totals	2,648,153	2,085,547	79
National Totals:	5,349,790	3,883,453	73

Source: National Emissions Data System (NEDS) - June, 1978



LEGEND:

NP Nonattainment or VOC point source emission less than 100 TPY

FIGURE 1. Nonattainment Counties or Counties With VOC Point Source Emissions Less Than 100 TPY

TABLE 3. Volatile Organic Compounds (VOC) Point Source Emissions Within Specified Distances of Trenton, New Jersey*

	Distance			
	≤ 300 mi.	≤ 400 mi.	≤ 500 mi.	Within EPA Regions I-V
Emissions in Nonattainment Counties	880,330	1,045,939	1,210,709	2,085,547
Emissions in Attainment or Unclassified Counties	38,972	68,662	124,719	562,606
TOTAL	919,302	1,114,601	1,335,428	2,648,153
% VOC Point Source Emissions Not Within Designated Nonattainment Areas	4.2	6.2	9.3	21

* Source: NEDS Data Base, June 1978

90 percent of the United States' point source emissions are situated in areas designated nonattainment (See Figure 2).

New Jersey has questioned the completeness of the data base within the EPA's NEDS emission data system and therefore implies that the information presented in Tables 1-3 is misleading. Although States are required to provide the appropriate information to keep NEDS complete and current,[3] it is likely that there are omissions in the data base. However such omissions, as there are, are likely to occur for both designated and unclassified areas and the percentage values of Tables 1-3 are reasonably accurate. This assumption is supported by using population data as a surrogate for emissions data. As Table 4 establishes, 75 percent of the population of EPA Regions I-V live in areas designated nonattainment. This percentage closely approximates the corresponding percentages of 71 percent and 79 percent for total and point source emissions presented in Tables 1 and 2, respectively.

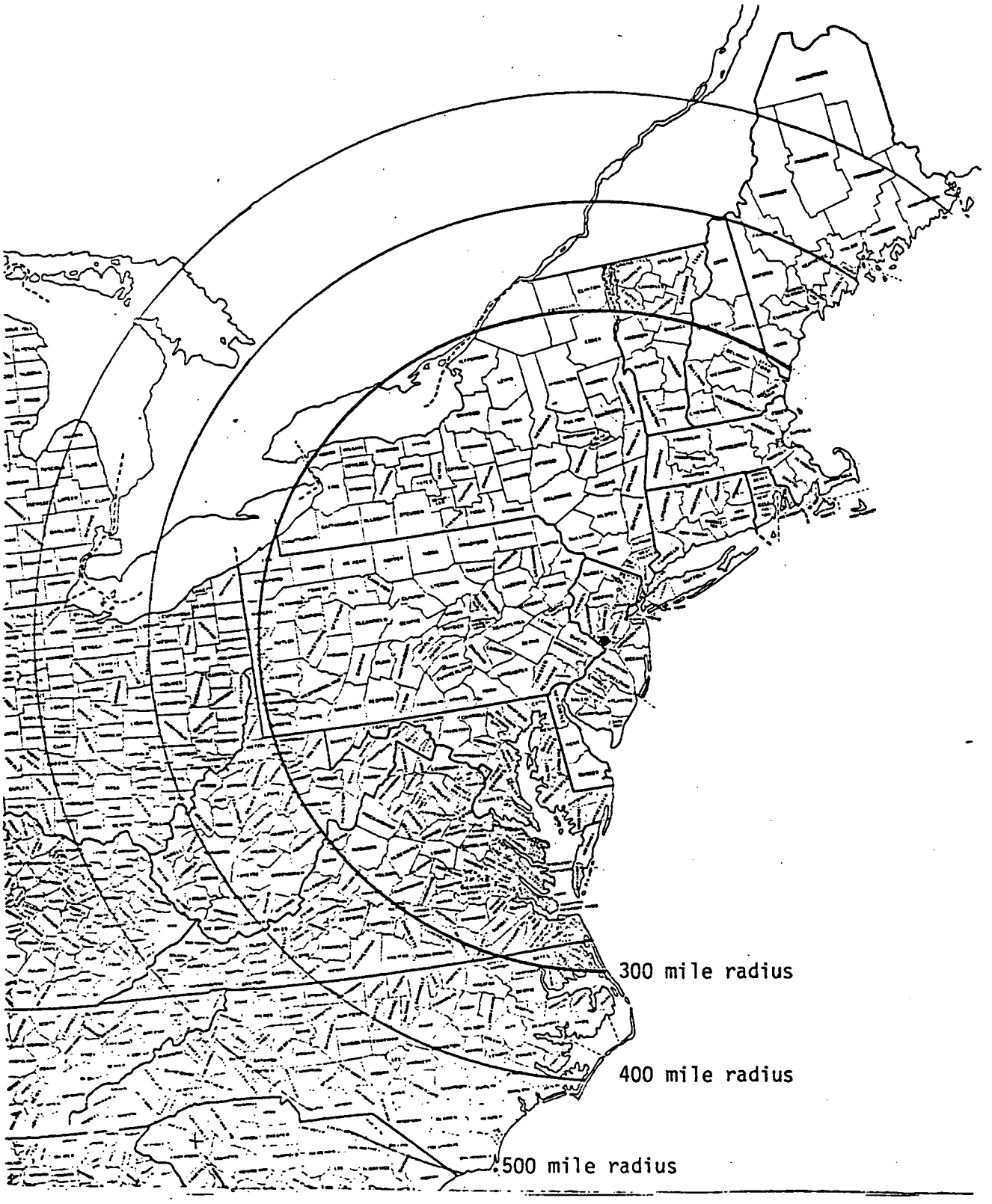


FIGURE 2. Counties within a specified radius of Trenton, N.J.

TABLE 4. Fraction of Population Within Counties Designated as Nonattainment for the Ozone NAAQS

EPA Region/State	Population Total	Population Nonattaining Counties	% Population in Nonattaining Counties
Region I	11,203,696	11,076,942	99
Connecticut	3,031,709	3,031,709	100
Maine	992,048	899,585	91
Massachusetts	5,051,203	5,051,203	100
New Hampshire	737,681	703,390	95
Rhode Island	946,725	946,725	100
Vermont	444,330	444,330	100
Region II	25,358,904	25,358,904	100
New Jersey	7,168,164	7,168,164	100
New York	18,190,740	18,190,740	100
Region III	22,276,794	18,270,734	82
Delaware	548,104	385,856	70
District of Columbia	756,510	756,510	100
Maryland	3,922,399	3,463,395	88
Pennsylvania	11,793,909	11,793,909	100
Virginia	3,511,644	1,871,064	53
West Virginia	1,744,237	-	-
Region IV	31,854,934	12,097,122	38
Alabama	3,444,165	1,271,539	37
Florida	6,789,440	4,430,796	65
Georgia	4,589,575	1,689,270	37
Kentucky	3,218,706	1,346,305	42
Mississippi	2,216,912	-	-
North Carolina	5,082,059	499,712	10
South Carolina	2,590,516	711,945	27
Tennessee	3,923,561	2,147,555	55
Region V	44,057,447	33,669,423	76
Illinois	11,113,976	9,293,771	84
Indiana	5,193,669	2,251,436	43
Michigan	8,875,083	7,754,871	87
Minnesota	3,804,971	2,238,944	59
Ohio	10,652,017	9,828,650	92
Wisconsin	4,417,731	2,301,751	52
Region VI	20,381,560	10,248,022	50
Arkansas	1,923,295	287,189	15
Louisiana	3,641,306	2,163,271	59
New Mexico	1,061,000	315,774	30
Oklahoma	2,559,229	1,010,307	39
Texas	11,196,730	6,471,481	58
Region VII	11,230,948	4,582,144	41
Iowa	2,824,376	678,992	24
Kansas	2,246,578	813,133	36
Missouri	4,676,501	2,636,868	56
Nebraska	1,483,493	453,151	31
Region VIII	5,576,561	2,560,161	46
Colorado	2,207,259	1,651,105	75
Montana	694,345	87,367	13
North Dakota	617,761	-	-
South Dakota	665,507	-	-
Utah	1,059,273	821,689	78
Wyoming	332,416	-	-
Region IX	22,212,772	21,332,775	96
Arizona	1,770,900	1,319,189	74
California	19,953,134	19,596,880	98
Nevada	488,738	416,706	85
Region X	6,213,121	3,035,989	49
Idaho	712,567	-	-
Oregon	2,091,385	1,339,875	64
Washington	3,409,169	1,696,114	50
Regions I-V Total	134,751,775	100,473,125	75
National Totals:	200,366,737	142,232,216	71

Source: 1970 Census of Population

3.0 EPA's OZONE DESIGNATIONS DO NOT PREJUDICE NEW JERSEY OR THE NORTHEASTERN STATES

3.1 New Source Review Requirements in Areas Which are Presently Designated Unclassified

In unclassified or attainment areas, prevention of significant deterioration (PSD) regulations require that all planned major VOC sources with emissions greater than or equal to 50 tons/year after control can be required to include in their PSD application up to one year's worth of continuous air quality monitoring data including monitoring for ozone levels. If the monitoring shows levels above the ozone standard, the new source would have to comply with new source requirements for sources locating in nonattainment areas. Thus, the data collected under the PSD program will be used to further examine whether an area is meeting the current ozone standard. See 40 C.F.R. 52.21(e) and (n). Moreover, if the monitoring data establish that violations exist, the area must be designated nonattainment and a revision to the State Implementation Plan (SIP) must be submitted within nine months. If the State fails to submit the revised plan the sanctions against further industrial growth in the area required by Section 110(a)(2)(I) will apply. Thus, if New Jersey's allegations concerning widespread nonattainment of the ozone standard are true, the unclassifiable designations adopted by some States will not result in competitive advantages for attracting new industry to those States.

If an area is determined to be nonattainment, the new source would be required to install Lowest Achievable Emission Rate (LAER) control techno and major existing sources would be required to install RACT. If the area i determined to be an attainment area, the proposed new source would be requir to apply best available control technology which is determined on a case-by-

basis. Therefore, in both attainment and nonattainment areas, all new point sources of emissions of VOC will be controlled.

3.2 *Implementation of Emission Control Programs in Unclassifiable Areas*

Despite the designation of an area as unclassifiable some VOC emission controls are required in these areas. Specifically, controls on motor vehicles and new sources are proceeding within such areas. This fact, together with the information set forth above establishing that the vast majority of existing VOC emissions are situated in areas designated nonattainment, supports the conclusion there will be little environmental impact on New Jersey due to the EPA's designation of rural areas without monitoring data as unclassifiable.

The Federal Motor Vehicle Control Program plays a vital part in the strategy to attain the ozone standard everywhere since approximately 40 percent of the country's VOC emissions result from motor vehicle emissions in both rural and urban areas.[4] That program will result in emission reduction to all areas of the country regardless of an area's designation and will be a major factor, along with controls in urban areas, to insure attainment of the ozone standard throughout the country.

Further, the area designation, whether nonattainment, attainment or unclassifiable, does not necessarily in and of itself dictate the applicable new or existing stationary source control requirements. There are essentially three reasons for this.

First, because air pollution emissions are transported from one area to another, the sources that cause or contribute to a NAAQS violation, or affect an area with clean air may actually be outside the designated nonattainment

or attainment area, respectively. Therefore, the specific control requirements which a source must meet are not necessarily dependent upon the designation of the area in which it is located, but rather the designation of the area which will be impacted by the source's emissions.

Second, many States are choosing to impose requirements over a broader geographic area than the designated nonattainment area for reasons of equity, simplicity of administration or added assurance that all sources which affect the nonattainment area are controlled and are making their revised emission limitations applicable Statewide.

Finally, Section 107(d) of the Act requires that attainment/nonattainment designations be made within a very short time period, and that these are to be composed of air quality control regions (or portions thereof), which are often based on State, county, or other political jurisdictional boundaries. This process is bound to include pockets where the air quality does not necessarily correspond to the specific designation of the area. However, these anomalies will be taken into account during the detailed process of State Implementation Plan development for the given nonattainment area and in the issuance of individual new source permits which, as already mentioned, are based upon the source's area of impact rather than its physical location.

3.3 Monitoring in Unclassified Areas which May Have a High Potential for Violating the Ozone NAAQS

The EPA has encouraged but not required Statewide nonattainment designations and the development of Statewide controls of volatile organic compounds. Additionally, the EPA is reviewing and analyzing existing scientific data to determine whether broader nonattainment designations are appropriate.

However, the existing data base may be insufficient to allow for a complete evaluation.[5] Therefore, the EPA Regional Administrators have been requested by the Assistant Administrator on October 12, 1978 to identify those areas designated unclassified which do not have monitoring data and have a high potential to exceed the standards.[6] Once these areas are identified, the EPA has recommended that the States require, in the 1979 SIP revisions, the application of RACT on most major sources of VOC emissions. RACT would be required for sources with VOC emissions greater than 100 tons/year potential and for which the EPA has issued a CTG (Control Techniques Guideline) by January 1978. The SIP revisions would have to include a commitment by the State to adopt additional regulations annually beginning in January 1980 for those sources for which the EPA has published CTGs in the preceding year. If States do not comply with this recommendation for their SIP revisions, they may be required to conduct monitoring for photochemical oxidants in the identified counties during the next year. If the new monitoring data shows violations of the ozone standard, the counties will be redesignated as nonattainment areas and a SIP will be required.

3.4 Procedures to Ensure Equity in Estimated Control Requirements

A major concern expressed by the State of New Jersey is that States which are downwind of unclassifiable areas will have to control emissions more stringently than would otherwise be necessary. This concern is unfounded. Procedures developed by the EPA allow States which are downwind of areas not attaining the ozone NAAQS to "take credit" for controls that would have to be adopted to attain the standards in upwind States. This provision avoids the problem of the downwind States having to overregulate to compensate for pollution originating in another State.

The EPA has provided guidance to the States for establishing organic emission control requirements to meet the oxidant standard in nonattainment areas.[7,8,9] Specifically, the guidance allows a downwind State to assume a reduced ozone design value prior to calculating control requirements. The rationale for this guidance is that upwind States are required to meet the air quality standard for ozone. Therefore, the downwind States may assume that ozone contributed by upwind sources of precursors will be reduced to levels of the standard or below. For example, if the second high hourly ozone concentration recorded in New Jersey during a year is .24 ppm ozone, and ozone transported into that State from upwind States is estimated to be .14 ppm ozone, New Jersey would be allowed to reduce the .24 ppm ozone value by an amount commensurate with the reduction of transport into the State to the ozone standard. The resulting reduced ozone design value would then be used to estimate organic emission control requirements in New Jersey. Thus, downwind States, such as New Jersey, are allowed to take credit for controls required in upwind States. The EPA believes that such a procedure eliminates any inequity attributable to transport of pollution from upwind States.

4.0 INTERPRETATION OF THE AIR QUALITY STANDARDS FOR OZONE AND ATTENDANT UNCERTAINTIES IN THE MONITORING DATA

4.1 Monitoring Requirements

The past National Ambient Air Quality Standard (NAAQS) for photochemical oxidants was 160 micrograms per cubic meter (or .08 parts per million [ppm]) maximum one hour concentration not to be exceeded more than once per year.[10] Much of the evidence used by New Jersey to indicate widespread violations of the NAAQS is based on aircraft data. Determining through aircraft data whether air quality ozone levels at ground level are being exceeded is not a straight-forward exercise. In fact, the Agency has determined that, at present, aircraft data can only be used qualitatively to evaluate air quality and not to require nonattainment designations for the national standard.

4.1.1 The NAAQS Consists of Exposure Level and Exposure Time

The national ozone standard consists both of an ambient exposure level and an exposure time. In addition, the standard applies at locations to which the general public has access. Aircraft data are of short duration and obviously are not collected at ground level. Moreover, the national ozone standard was set at or below observed threshold levels corresponding with adverse effects on health. The standard is designed to provide some factor of safety in order to protect sensitive members of the population and to protect against synergistic effects arising from simultaneous exposure to a number of pollutants.

Aircraft measurements are of short duration and are spatially integrated average concentrations observed over short periods. For example, assuming an aircraft were traveling 120 miles per hour and each ozone reading

represented a five minute integrated average concentration, the recorded ozone concentration would have been sampled over a ten mile path several hundreds of feet above the earth's surface. There are scientific uncertainties in relating such data to the national standard and it can not be claimed, as New Jersey does, that aircraft recordings of ozone levels higher than the ozone standard is clear evidence of widespread violations of the standard without having first documented that such measurements establish that ozone levels at ground level are exceeding the exposure level stated by the standard for an hour or more. Such documentation does not exist. While the EPA is examining this issue at the present time, there is no definitive scientific guidance available. Moreover, the evidence that is available suggests that aircraft data are a limited proxy for ground level monitoring data.

4.1.2 Aircraft Data Cited by the State of New Jersey

The aircraft data cited by the State of New Jersey in Reference 2 as supporting the need for Statewide nonattainment designations are generally not good indications of ozone concentration levels observed concurrently at or near the ground. For example, in only 30 percent of the instances in which ozone concentrations greater than .08 ppm were observed aloft did concurrent hourly ozone concentrations observed at ground level approximately beneath the flight track exceed .08 ppm. Using data cited by the State of New Jersey, Tables 5 and 6 illustrate the difficulties of using aircraft data as an indicator of ozone concentrations observed at the ground.[2] As shown in Table 5, 12 of the 21 aircraft flights cited by New Jersey indicated ozone concentrations aloft in excess of .08 ppm. Fewer than half of these indicated a corresponding concentration of .08 ppm or more at or near the ground.

TABLE 5. Comparability of Aircraft and Ground Level Data Provided by the State of New Jersey

Concentrations > .08 ppm Observed Aloft / Concentrations > .08 ppm Observed at the Ground	YES	NO	TOTAL
Yes	5	1	-
No	7	8	-
Total Number of Observations	12	9	21
Fraction of "Correct" Indications	5/12	8/9	13/21

TABLE 6. Comparability of Aircraft and Continuously Measured Ground Level Data Provided by the State of New Jersey

Concentrations > .08 ppm Observed Aloft / Concentrations > .08 ppm Observed at the Ground	YES	NO	TOTAL
Yes	3	1	-
No	7	6	-
Total Number of Observations	10	7	17
Fraction of "Correct Indications	3/10	6/7	9/17

Table 6 differs from Table 5 in that only flights for which continuous ground level data are available beneath the flight track are considered. In these latter comparisons, in only 30 percent of the cases where ozone concentrations exceeding .08 ppm were observed aloft were correspondingly high concentrations observed with the continuous monitors. It is likely that a number of these discrepancies can be explained by the presence of local sinks for ozone near the continuous monitor (e.g., sources of nitric oxide emissions) or by the time of day or prevailing meteorological conditions under which the measurements were made.

Regardless, the conditions under which ozone concentrations measured aloft are good indicators of concentrations at ground level have not been scientifically established. The EPA is studying the question at present[5] but until those studies are completed, the EPA will only use aircraft data to make qualitative assessments of air quality. Accordingly, aircraft measurements were used by the EPA as one reason for encouraging States in the Eastern portion of the country to make Statewide nonattainment designations for ozone pollution. However, the Agency does not believe that aircraft data constitute sufficient bases for mandatory Statewide nonattainment designations.

4.2 Geographic Area Represented by a Detected Violation of the NAAQS

There is considerable uncertainty over the geographic area represented by a recorded violation of the ozone standard at an individual ground level monitor. As Reference 11 suggests, the area represented by an ozone monitor depends on the site characteristics (e.g., the environment immediately surrounding the monitor). However, unlike CO and TSP for which observed violations frequently appear to be the result of localized problems, violations

of the ozone standard appear to be more widespread. Consequently, the Agency has strongly suggested that designated nonattainment areas for the ozone standard be at least as large as a county. In most cases, a county represents the smallest geographical or jurisdictional boundary for which most control programs will be centered. As the EPA develops more scientific guidance on the area represented by specific ozone monitors, designation areas will be modified as appropriate.

5.0 CHEMICAL AND METEOROLOGICAL CONSIDERATIONS IN THE FORMATION AND TRANSPORT OF OZONE AND ITS PRECURSORS

Ozone (O_3) is a "secondary pollutant" which is a pollutant not emitted directly by a source of pollution. Instead, secondary pollutants arise from chemical reactions among other pollutants (i.e., precursors) which themselves may or may not be directly emitted by sources. Because ozone is a secondary pollutant, highest concentrations do not necessarily occur in the immediate vicinity of the sources which emit the precursors. For a significant amount of ozone to be formed, two conditions must occur. First, organic precursors and oxides of nitrogen (NO_x) must both be present in sufficient concentrations; and second, ultraviolet radiation from sunlight must be sufficient to enable photodissociation of nitrogen dioxide (NO_2) to sustain the sequence of reactions leading to ozone formation. Because the chemical lifetimes of ozone and most of its precursors appear to be limited, and because of the impact of continual dilution, there are geographical limits to significant transport of ozone unless high concentrations can be sustained by interaction with fresh precursor emissions.

5.1 Chemistry of Ozone Formation and Transport

5.1.1 Chemical Stability of Ozone

The chemical stability of ozone and its precursors is important in estimating geographical distances of significant of ozone transport. If these pollutants decay away to negligible amounts within a few hours, their impact at remote locations will be small. If, on the other hand, they are chemically stable, then under adverse meteorological conditions their impact could be significant at remote sites.

The bulk of available evidence suggests that in the absence of fresh precursor emissions, the lifetime of ozone in the atmosphere is limited.[14,19,20,36] The chemical stability of ozone and other pollutants is frequently expressed in terms of their half lives (i.e., the time it would take a pollutant to decay to one half of its original concentration). The lifetime of ozone in the atmosphere depends on the extent to which prevailing meteorological conditions enable the ozone to come into contact with scavengers and the earth's surface. Scavengers such as airborne aerosols, some naturally emitted organic pollutants (e.g., terpenes) and nitric oxide (NO) as well as surface deposition all act to limit the lifetime of ozone in the atmosphere. In the absence of fresh precursor emissions, it is unlikely that significant concentrations of ozone can persist near the earth's surface for greater than about 36 hours. Therefore, emissions from sources within 36 hours of New Jersey would be most likely to impact on ozone levels in New Jersey. As discussed above, within 36 hours travel time of New Jersey, almost all sources of pollution causing ozone are situated in areas designated nonattainment.

The 36 hour transport estimate is based on available information on the stability of ozone under different conditions. It has been clearly demonstrated that ozone trapped aloft overnight is quite stable.[12,13] Ozone which is transported over water also appears to have a long lifetime of several days.[14,15,16,17,18] Trajectories over water could therefore present a special case in which transport from very remote sources could be significant. For example, it has been demonstrated that ozone transport from the Northeastern U.S. impacts on the coast of Virginia.[18] A review of rural diurnal ozone concentration patterns reported in several field studies[14,19] suggests that

the half life of ozone in rural areas near the earth's surface at night is in the order of 5-12 hours. Nighttime half life of ozone within an urban plume near the earth's surface appears to be about 2-3 hours.[14,19]

It is much more difficult to determine daytime half life of ozone over land because fresh ozone is being synthesized as new precursor emissions are injected into the air parcel. Thus, data reflecting the buildup of ozone during the day may be the result of new ozone being synthesized more rapidly than the depletion of "aged ozone" resulting from remote sources. However, recent modeling of the stability of ozone to simulate daytime conditions in a mixture of carbon monoxide, methane and water vapor exposed to sunlight suggests that the daytime half life of ozone in such a system is 5-7 hours.[20] Such a mixture consists of naturally occurring stable compounds. As such, there is likely to be slower destruction of ozone under such conditions. Therefore, the modeling exercise suggests that daytime half life of ozone over land is likely to be less than seven hours.

By combining the estimated daytime and nighttime half lives of ozone, the EPA estimates that 36 hours after a significant amount of ozone is formed, only 25 percent remains in the atmosphere (see Table 7). Furthermore, the 36 hour estimate is a conservative one for several reasons. The estimate ignores any impact of dilution, assumes ozone does not decay at all overnight, assumes the daytime half life of ozone is six hours, and assumes transport begins at 6:00 p.m. -- the most conservative possible assumption in this scenario.

TABLE 7. SCENARIO ILLUSTRATING OZONE TRANSPORT

Elapsed Time, hr	Day	Time of Day	Percent of Initial Ozone Remaining	Ozone Concentration, ppm
0	1	6 p.m.	100	.16
6	1	Midnight	100	.16
12	2	6 a.m.	100	.16
18	2	Noon	50	.08
24	2	6 p.m.	25	.04
30	2	Midnight	25	.04
36	3	6 a.m.	25	.04

5.1.2 Chemical Stability of Ozone Precursors

There are two classes of ozone precursors: volatile organic compounds (VOC) and oxides of nitrogen (NO_x). There is information which implies that long range transport of NO_x is not significant.[14,15,19,21,22,23] There is greater uncertainty about the transport of volatile organic precursors; however, the available information suggests that the half lives of most volatile organic compounds are less than 24 hours.[24,25]

Theoretical and limited monitoring data suggest rapid daytime decay of most volatile organic compounds during the summer months.[24,25,26] Organic compounds appear to be somewhat more persistent at night. Low concentrations of slow reacting compounds could survive for several days; however, modeling studies suggest that these low concentrations do not contribute significantly to ambient ozone concentrations, particularly when compared with fresh precursor emissions.[23]

Numerous field studies of urban plumes have failed to detect elevated levels of reactive pollutants greater than one travel day away from the source of emission.[14,20,23,26,27] In studies described in Reference 25, organic pollutants and ozone were sampled at a site approximately 100 km from St. Louis. When the urban plume impacted the site during the day, elevated ozone was observed, but organic pollutants (with the exception of nonreactive halogenated compounds) were not above background levels. At night however, organic pollutants were found to be higher than background levels and ozone was depressed. Occasionally, transport from a city (Chicago) about 270 km away could be detected using halogenated compounds as tracers. No significant buildup in organic pollutants or in ozone could be detected in these cases.

These observations are consistent with the theoretical findings summarized in Reference 25 which suggest that rapid decay of most organic compounds occurs during summer days (the ozone pollution season) with the decay being slower at night. Half lives of most volatile organic compounds are probably less than 24 hours. See References 24, 25, 26 and 36. Additional support comes from monitoring studies conducted in rural, remote areas in which ambient levels of organic compounds are typically .10 ppmC or less.[20] Such data could be presumed to be a conservative representation of cases where the monitoring site is not impacted upon by significant sources within a day or two of travel time.

Several simulations have been conducted with chemical kinetics models to estimate the impact of organic precursors transported from afar as compared with emissions of fresh precursors.[23] In scenarios in which concentrations of VOC of .10 ppmC (about the level seen at remote sites) were added to the model, negligible impacts on peak ozone concentrations ($\sim$ .006 ppm) were typically observed.

To summarize, most organic precursors decay or are diluted to very low concentrations before they are transported over great distances. The modeling exercises imply that these low levels are not significant in ozone formation far downwind when compared to the impact of locally generated precursors. In short, because of dilution and instability of most precursors, long range transport of ozone precursors does not appear to significantly contribute to local ozone concentrations in the urban areas of the Northeast. In addition, unless long range transport of ozone is supplemented by more locally emitted precursors (which, as shown earlier, are subject to controls

in the case of New Jersey) the chemical lifetime of ozone, as a rule, is insufficient to sustain high concentrations for more than about 36 hours.

5.2 Meteorology of Ozone Episodes

Ozone episodes are typically characterized by light and variable winds. Since pollutants are borne by the winds, the distances over which transport of pollutants is significant is limited to 300-500 miles which is the distance pollutants could travel within about 36 hours with light and variable winds. This information suggests that New Jersey's concerns about significant adverse environmental impacts from ozone generated from unregulated sources more than about 500 miles away from New Jersey is unwarranted.

As New Jersey has commented, highest concentrations of ozone in the Midwest appear to occur in the presence of stagnating or, more generally, slow-moving high pressure systems. Highest ozone concentrations within such high pressure systems usually occur in the western or back side. In general, temperatures are warmer on the back side of the system, and it is possible that air within that sector may have been within the system somewhat longer than air further east. However, simply analyzing the movement of weather systems from the Midwest to the East does not establish that pollution generated in the Midwest is transported to the East.

As several investigators have pointed out, pollutants are transported by the wind, not by the weather system.[14,28] Therefore, while a parcel of air may remain within the same weather system for up to a few days, it is not correct to think of a high pressure system as a self-contained mass of air which migrates intact toward the East Coast from points west or south. Rather,

it is more accurate to compare air parcel trajectories during high ozone weather conditions with trajectories observed on other days. Comparisons of this nature have been done at rural and urban sites in the Midwest and the South (see References 14 and 19). Such comparisons show that, over a 36-hour period, the area covered by an air parcel in the lowest 300 meters of the atmosphere is generally rather limited (usually < 300 miles) on days observing high ozone.

There are several factors associated with transport and buildup of ozone that make it unlikely that ozone transport over extended distances (greater than 300-500 miles) is significant. These factors are the following:

1. High ozone buildup generally occurs in high pressure systems migrating from west to east. However, pollutants emitted into such systems do not move with the system itself but are transported by the wind circulating about the system. Hence, an air parcel into which ozone or precursors are injected will usually take a more circuitous route than the system itself.

2. There is no assurance that an air parcel will remain within a high pressure system over an extended travel distance. Parcels do not travel within such systems indefinitely but exit or "spin off" within hours or days and are replaced by other parcels entering the system. It has been estimated that the range for retention of an air parcel within a slow moving high pressure system depends on the speed with which the system migrates across the country and varies from less than one to as many as six days.[19] Therefore, as travel distance increases, it becomes less probable that a specific air parcel in a high pressure system will stay in that system.

3. Ozone buildup is associated with relatively light and variable winds. Assuming that in such a system the transport wind averages ten miles per hour or less, an air parcel would travel at most only 200-300 miles over a day's time. At this wind speed it would take three-to-five days or more to traverse more than 1,000 miles. The chemical instability of ozone would make survival of ozone over such long distances highly improbable. If wind speeds were much greater, dilution would be correspondingly greater and ozone concentration buildup would be unlikely. Therefore, the limit for significant contribution of precursor sources to ozone concentration is probably no more than about 300-500 miles. Beyond those distances, the relative contribution would decline considerably. It would be difficult to determine a precise distance beyond which contribution becomes negligible. However, significant transport from remote precursor source areas as far as 1,000 miles away appears to be highly unlikely.

In short, there are numerous studies[14,15,19,21,22.23] which have demonstrated that precursor and ozone transport over tens to a few hundred miles is important to the buildup of high ozone concentrations. The EPA participated in some of these studies and acknowledges that such transport and subsequent impact does occur. However, the EPA differs with New Jersey on the range over which significant transport and impact may occur. Supporting technical studies[12,29,30,31,32,33] submitted by New Jersey, which have been conducted by the Interstate Sanitation Commission (ISC), argue that significant transport on some occasions from source areas as far as the Texas-Louisiana Gulf Coast and parts of the Midwest can impact on New Jersey. Some of these areas represent a transport distance of over 1,000 miles.

The EPA is not able to accept the conclusions reached by these studies. Much of the bases for the ISC analyses are trajectory estimates which indicate the probable flow of air and buildup of ozone observed in the general area of the trajectory over a period of days. Such analyses do not establish transport distances since the air flow does not necessarily demonstrate that a reactive pollutant like ozone can survive for a period of time required for travel over such a great distance. The ISC studies contain some questionable assumptions in their attempts to justify very long distance transport at sustained high ozone levels. In multiday transport cases, they assumed that ozone is regenerated on the day(s) after initial formation even without addition of new precursors. The ISC authors rely on smog chamber studies that were subject to chamber wall interferences. In shorter duration transport over long distances, they assumed mean transport wind speeds on the order of 45 miles per hour which would cause considerable dilution of precursor injections into an air mass as well as considerable dilution of ozone or precursors within an air mass. Regardless of the validity of these assumptions, it is very difficult to conclusively demonstrate very long range transport toward the Northeast because of the ambiguities introduced by considerable potential for fresh precursor emissions along the way.

6.0 ADDITIONAL COMMENTS SUBMITTED BY NEW JERSEY

New Jersey has also commented that the EPA did not use certain data available to it in making the designations. Specifically, New Jersey has alleged that certain rural monitoring data were excluded in designating nonattainment areas. The air quality data base utilized by the Agency is the most complete one which was available at the time of the designations. In an effort to ensure that erroneous designations based on faulty data were not made, only those data collected using appropriate quality assurance procedures were used to make nonattainment designations.

In addition to regularly reported data, rural data collected by the EPA in special field studies or additional data certified as valid by the EPA Regional Offices were used to make designations. In addition the EPA, through a contract study, reviewed privately collected ozone data at rural sites in the Western United States for assessing ambient ozone levels. After completion of the contract study, the EPA Regional Offices were contacted to determine whether specific privately collected data were considered valid. Only those data in the report which the appropriate Regional Office could assert were valid were included in SAROAD (i.e., the EPA's computerized air quality data base).

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